

GRADE 7

Pearson Appeal of Prentice Hall Courses 1, 2 and 3

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Indiana Appeal for Prentice Hall Mathematics Course 2

Standards that Received a "2" Rating

Pearson Correlation Documentation			
Standard	Definition	Lesson Covered	Notes
7.RP.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.	Lessons 5-1, 5-2, 5-4, 5-5, CC-7, Activity Labs 5-4a, 5-5a	Final format of lesson CC-7 included in appeal binder

Standards that Received a "1" Rating

Pearson Correlation Documentation			
Standard	Definition	Lesson Covered	Notes
7.RP.2.a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.	Lessons 5-3, CC-10	Final format of lesson CC-10 included in appeal binder
7.RP.2.b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.	Lessons 5-3, CC-11	Final format of lesson CC-11 included in appeal binder
7.RP.2.c	Represent proportional relationships by equations.	Lessons 5-4 CC-11, GPS p. 249	Final format of lesson CC-11 included in appeal binder
7.RP.2.d	Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.	Lessons 10-2, 10-3, CC-10	Final format of lesson CC-10 included in appeal binder
7.NS.1.c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.	Lessons 1-7, CC-1	Final format of lesson CC-1 included in appeal binder

7.NS.1.d	Apply properties of operations as strategies to add and subtract rational numbers.	Lessons 1-7, CC-1, Activity Lab 1-7a	Final format of lesson CC-1 included in appeal binder
7.NS.2.a	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing realworld contexts.	Lessons 1-8, CC-2	Final format of lesson CC-2 included in appeal binder
7.NS.2.b	Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.	Lessons 1-8, CC-3	Final format of lesson CC-3 included in appeal binder
7.NS.2.c	Apply properties of operations as strategies to multiply and divide rational numbers.	Lessons CC-2, CC-3	Final format of lessons CC-2 and CC-3 included in appeal binder
7.EE.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	Lesson CC-4	Final format of lesson CC-4 included in appeal binder
7.EE.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach	Lessons 4-5, 4-6, CC-5	Final format of lesson CC-5 included in appeal binder
7.EE.4.b	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.	Lesson CC-6	Final format of lesson CC-6 included in appeal binder

7.G.2	Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	Lesson CC-8	Final format of lesson CC-8 included in appeal binder
7.G.3	Describe the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	Lesson CC-9	Final format of lesson CC-9 included in appeal binder
7.SP.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.	Lesson 11-4	
7.SP.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.	Lessons 11-5, CC-13	Final format of lesson CC-13 included in appeal binder
7.SP.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.	Lesson CC-12	Final format of lesson CC-12 included in appeal binder
7.SP.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	Activity Lab 1-10b	
7.SP.8.c	Design and use a simulation to generate frequencies for compound events.	Lessons 12-4, CC-14	Final format of lesson CC-14 included in appeal binder

Correlation of Standards for Mathematical Content

Prentice Hall Course 2

The following shows the alignment of *Prentice Hall Course 2* to the Grade 7 Common Core State Standards for Mathematics.

Standards for Mathematical Content		Where to find in <i>PH Course 2</i>
Ratios and Proportional Relationships		
Analyze proportional relationships and use them to solve real-world and mathematical problems.		
7.RP.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour.</i>	5-1, 5-25-4, 5-5, CC-7, Activity Labs 5-4a, 5-5a
7.RP.2	Recognize and represent proportional relationships between quantities.	5-3, 5-4, 5-5 Activity Lab 5-4a
7.RP.2.a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.	5-3, CC-10
7.RP.2.b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.	5-3, CC-11
7.RP.2.c	Represent proportional relationships by equations. <i>For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$</i>	5-4, CC-11, GPS p. 249
7.RP.2.d	Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.	10-2, 10-3, CC-10
7.RP.3	Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.	6-7, 6-8. 9-7
The Number System		

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.		
7.NS.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.	1-7, 3-2, 3-3, CC-1
7.NS.1. a	Describe situations in which opposite quantities combine to make 0. <i>For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.</i>	1-7, Activity Lab 1-7a
7.NS.1. b	Understand $p + q$ as the number located a distance $ q $ from p , in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.	1-6, 1-7
7.NS.1. c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.	1-7, CC-1
7.NS.1. d	Apply properties of operations as strategies to add and subtract rational numbers.	1-7, CC-1, Activity Lab 1-7a
7.NS.2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.	1-3, 1-4, 1-8, 2-7, 3-4, 3-5, CC-2, CC-3
7.NS.2. a	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.	1-8, CC-2
7.NS.2. b	Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.	1-8, CC-3
7.NS.2. c	Apply properties of operations as strategies to multiply and divide rational numbers.	CC-2, CC-3
7.NS.2. d	Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.	2-6, 2-7
7.NS.3	Solve real-world and mathematical problems involving the four operations with rational numbers.	1-3, 1-4, 1-8, 3-4, 3-5, CC-

Correlation of Common Core State Standards

	NOTE: Computations with rational numbers extend the rules for manipulating fractions to complex fractions	2, CC-3
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Standards for Mathematical Content		Where to find in PH Course 2
Expressions and Equations		
Use properties of operations to generate equivalent expressions.		
7.EE.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	CC-4
7.EE.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. <i>For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."</i>	6-4, 6-6, 6-7, 9-8, Activity Lab 9-8b
7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. <i>For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.</i>	1-2, 1-3, 1-4, 2-6, 3-1, 3-2, 3-3, 3-4, 3-5, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, 6-8
7.EE.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.	4-1, 4-2
7.EE.4. a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. <i>For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?</i>	4-5, 4-6, CC-5
7.EE.4. b	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. <i>For example: As a salesperson, you are paid \$50 per</i>	CC-6

Correlation of Common Core State Standards

	<i>week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.</i>	
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Standards for Mathematical Content		Where to find in <i>PH Course 2</i>
Geometry		
Draw, construct, and describe geometrical figures and describe the relationships between them.		
7.G.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	5-5, 5-6, Activity Lab 5-6a
7.G.2	Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	CC-8
7.G.3	Describe the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	CC-9
Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.		
7.G.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	8-5, Activity Lab 8-5a
7.G.5	Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	7-2
7.G.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	8-2, 8-3, 8-4, 8-9, 8-10

Standards for Mathematical Content		Where to find in PH Course 2
Statistics and Probability		
Use random sampling to draw inferences about a population.		
7.SP.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.	11-4
7.SP.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. <i>For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.</i>	11-5, CC-13
Draw informal comparative inferences about two populations.		
7.SP.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. <i>For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.</i>	CC-12
7.SP.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i>	Activity Lab 1-10b
Investigate chance processes and develop, use, and evaluate probability models.		
7.SP.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely	12-1

Correlation of Common Core State Standards

	event, a probability around $1/2$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	
7.SP.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. <i>For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.</i>	12-1, 12-2, Activity Lab 12-2a
7.SP.7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.	12-2, Activity Lab 12-2a,
7.SP.7. a	Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <i>For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.</i>	12-1
7.SP.7. b	Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. <i>For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?</i>	12-2, Activity Lab 12-2a,
7.SP.8	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.	12-3, 12-4
7.SP.8. a	Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.	12-4
7.SP.8. b	Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.	12-3, 12-4
7.SP.8. c	Design and use a simulation to generate frequencies for compound events. <i>For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?</i>	12-4, CC-14

Pacing for a Common Core Curriculum with *Prentice Hall Course 2*

This pacing chart can help you plan your course as you transition to a curriculum based on the Common Core State Standards (CCSS). The Chart indicates the Standard(s) for Mathematical Content that each lesson addresses and proposes pacing for each chapter. Included in the chart are CC Lessons that offer in-depth coverage of certain standards. These lessons along with the lessons in the Student Edition provide comprehensive coverage of all of the Common Core State Standards for Grade 7.

The suggested number of days for each chapter is based on a traditional 45-minute class period and on a 90-minute block period. The total of 144 days of instruction leaves time for review and enrichment lessons, additional activity labs, assessments, and projects.

* Content to meet the Grade 7 Common Core State Standards
+ Reviews content from previous years
∞ Content for enrichment

	Standards of Mathematical Content	On-Level	Advanced
Chapter 1 Decimals and Integers	Traditional 14 days	Block 7 days	
1-1 Using Estimation Strategies	Reviews 4.OA.3	+	
1-2 Adding and Subtracting Decimals	7.EE.3	*	*
1-3 Multiplying Decimals	7.NS.2, 7.NS.3, 7.EE.3	*	*
1-4 Dividing Decimals	7.NS.2, 7.NS.3, 7.EE.3	*	*
1-5 Measuring in Metric Units	Reviews 5.MD.1	+	
1-6 Comparing and Ordering Integers	7.NS.1.b	*	*
1-7a Activity Lab: Modeling Integer Addition and Subtraction	7.NS.1.a, 7.NS.1.d	*	*
1-7 Adding and Subtracting Integers	7.NS.1, 7.NS.1.a, 7.NS.1.b, 7.NS.1.c, 7.NS.1.d	*	*
1-8 Multiplying and Dividing Integers	7.NS.2, 7.NS.2.a, 7.NS.2.b, 7.NS.3	*	*
1-9 Order of Operations and the Distributive Property	Reviews 6.EE.3	+	

Pacing for a Common Core Curriculum

	Standards of Mathematical Content	On-Level	Advanced
1-10Mean, Median, Mode, and Range	Reviews 6.SP.5	+	+
1-10bActivity Lab: Box and Whisker Plots	7.SP.4	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 2 Exponents, Factors, and Fractions Traditional 8 days Block 4 days			
2-1 Exponents and Order of Operations	Reviews 6.EE.1	+	+
2-2 Prime Factorization	Reviews 6.NS.4	+	
2-3 Simplifying Fractions	Reviews 5.NF.1	+	
2-4 Comparing and Ordering Fractions	Reviews 4.NF.2	+	
2-5 Mixed Numbers and Improper Fractions	Reviews 5.NF.1, 5.NF. 2	+	
2-6 Fractions and Decimals	7.NS.2.d, 7.EE.3	*	*
2-7 Rational Numbers	7.NS.2, 7.NS.2.d	*	*
2-8 Scientific Notation	Prepares for 8.EE.4	∞	∞
Chapter 3 Operations with Fractions Traditional 14 days Block 7 days			
3-1 Estimating with Fractions and Mixed Numbers	7.EE.3	*	*
3-2 Adding and Subtracting Fractions	7.NS.1, 7.EE.3	*	*
3-3 Adding and Subtracting Mixed Numbers	7.NS.1, 7.EE.3	*	*
CC-1 Addition and Subtraction of Rational Numbers	7.NS.1, 7.NS.1.c, 7.NS.1.d	*	*
3-4 Multiplying Fractions and Mixed Numbers	7.NS.2, 7.NS.3 7.EE.3	*	*
CC-2 Multiplication of Rational Numbers	7.NS.2, 7.NS.2.a, 7.NS.2.c, 7.NS.3	*	*
3-5 Dividing Fractions and Mixed Numbers	7.NS.2, 7.NS.3 7.EE.3	*	*
CC-3 Division of Rational Numbers	7.NS.2, 7.NS.2.b, 7.NS.2.c, 7.NS.3	*	*
3-6 Changing Units in the Customary System	Reviews 5.MD.1	+	
3-7 Precision			∞
3-8 The Distributive Property	Reviews 6.EE.2, 6.EE.2b, 6.EE.3	+	

	Standards of Mathematical Content	On-Level	Advanced
Chapter 4 Number Theory and Fractions		Traditional 16 days Block 8	
4-1 Evaluating and Writing Algebraic Expressions	7.EE.4	*	*
CC-4 Simplifying Expressions	7.EE.1	*	*
4-2 Using Number Sense to Solve Equations	7.EE.4	*	*
4-3 Solving Equations by Adding or Subtracting	Reviews 6.EE.7	+	
4-4 Solving Equations by Multiplying or Dividing	Reviews 6.EE.7	+	
4-5 Exploring Two-Step Problems	7.EE.4.a	*	*
4-6 Solving Two-Step Equations	7.EE.4.a	*	*
CC-5 Solving Equations of the Form $p(x + q) = r$	7.EE.4.a	*	*
4-7 Graphing and Writing Inequalities	Reviews 6.EE.8	+	+
4-8 Solving Inequalities by Adding and Subtracting	Prepares for 7.EE.4.b	*	*
4-9 Solving Inequalities by Multiplying and Dividing	Prepares for 7.EE.4.b	*	*
CC-6 Solving Inequalities	7.EE.4.b	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 5 Ratios, Rates, and Proportions Traditional 16 days Block 8 days			
5-1 Ratios	7.RP.1	*	*
5-2 Unit Rates and Proportional Reasoning	7.RP.1	*	*
5-2 Extension Using Conversion Factors	7.RP.1	*	*
CC-7 Unit Rates and Ratios of Fractions	7.RP.1	*	*
5-3 Proportions	7.RP.2, 7.RP.2.a, 7.RP.2.b	*	*
5-4a Activity Lab Exploring Similar Figures	7.RP.1	*	*
5-4 Solving Proportions	7.RP.1, 7.RP.2, 7.RP.2.c	*	*
GPS: Proportions and Equations p. 249	7.RP.2.c	*	*
5-5a Activity Lab: Exploring Similar Figures	7.RP.1	*	*
5-5 Using Similar Figures	7.RP.1, 7.RP.2, 7.G.1	*	*
5-6 Maps and Scale Drawings	7.G.1	*	*
Chapter 6 Percents Traditional 14 days Block 7 days			
6-1 Understanding Percents	Reviews 6.RP.3.c	+	
6-2 Percents, Fractions, and Decimals	7.EE.3	*	*
6-3 Percents Greater Than 100% or Less Than 1%	7.EE.3	*	*
6-4 Finding a Percent of a Number	7.EE.3	*	*
6-5 Solving Percent Problems Using Proportions	7.EE.3	*	*
6-6 Solving Percent Problems Using Equations	7.EE.3	*	*
6-7 Applications of Percent	7.RP.3, 7.EE.3	*	*
6-8 Finding Percent of Change	7.RP.3, 7.EE.3	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 7 Geometry		Traditional 8 days Block 4 days	
7-1 Lines and Planes	Reviews 4.G.1	+	
7-2 Identifying and Classifying Angles	7.G.5	*	*
7-3 Triangles	Reviews 5.G.4	+	+
CC-8 Drawing Triangles	7.G.2	*	*
7-4 Quadrilaterals and Other Polygons	Reviews 5.G.4	+	
7-5 Congruent Figures	Prepares for 8.G.2		∞
7-6 Circles	Prepares for 7.G.4	+	
7-7 Circle Graphs		∞	∞
7-8 Constructions		∞	∞
Chapter 8 Measurement		Traditional 14 days Block 7 days	
8-1 Estimating Perimeter and Area	Reviews 6.G.1	+	
8-2 Area of a Parallelogram	7.G.6	*	*
8-3 Perimeter and Area of a Triangle	7.G.6	*	*
8-4 Areas of Other Figures	7.G.6	*	*
8-5a Activity Lab: Modeling a Circle	7.G.4	*	*
8-5 Circumference and Area of a Circle	7.G.4	*	*
8-6 Square Roots and Irrational Numbers	Prepares for 8.NS.1		∞
8-7 The Pythagorean Theorem	Prepares for 8.G.6		∞
8-8 Three-Dimensional Figures	Reviews 5.MD.5.a	+	
CC-9 Cross Sections	7.G.3	*	*
8-9 Surface Areas of Prisms and Cylinders	7.G.6	*	*
8-10 Volumes of Prisms and Cylinders	7.G.6	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 9 Patterns and Rules		Traditional 10 days Block 5 days	
9-1 Patterns and Graphs	Reviews 5.OA.3	+	
9-2 Number Sequences	Reviews 5.OA.3	+	
9-3 Patterns and Tables	Prepares for 8.SP.4	∞	∞
9-4 Function Rules	Prepares for 8.F.1	∞	∞
9-5 Using Tables, Rules, and Graphs	Prepares for 8.F.2		∞
9-6 Interpreting Graphs	Prepares for 8.F.5		∞
9-7 Simple and Compound Interest	7.RP.3	*	*
9-8 Transforming Formulas	7.EE.2	*	*
9-8b Activity Lab: More About Formulas	7.EE.2	*	*
Chapter 10 Graphing on the Coordinate Plane		Traditional 8 days Block 4 days	
10-1 Graphing Points in Four Quadrants	Reviews 6.NS.8	+	
10-2 Graphing Linear Equations	7.RP.2.d	*	*
10-3 Finding the Slope of a Line	7.RP.2.d	*	*
CC-10 Graphs and Proportional Relationships	7.RP.2.a, 7.RP.2.d	*	*
CC-11 Constant of Proportionality	7.RP.2.b, 7.RP.2.c	*	*
10-4 Graphing Nonlinear Relationships	Prepares for 8.F.3, 8.F.4		∞
10-5 Translations	Prepares for 8.G.1		∞
10-6 Line Symmetry and Reflections	Prepares for 8.G.1		∞
10-7 Rotational Symmetry and Rotations	Prepares for 8.G.1		∞

		Standards of Mathematical Content	On-Level	Advanced
Chapter 11 Displaying and Analyzing Data		Traditional 10 days Block 5		
11-1	Reporting Frequency	Reviews 6.SP.4	+	
11-2	Spreadsheets and Data Displays	Reviews 6.SP.4	+	
11-3	Stem-and-Leaf Plots		∞	∞
CC-12	Data Variability	7.SP.3	*	*
11-4	Random Samples and Surveys	7.SP.1	*	*
11-5	Estimating Population Size	7.SP.2	*	*
CC-13	Random Samples	7.SP.2	*	*
11-6	Using Data to Persuade		∞	∞
11-7	Exploring Scatter Plots	Prepares for 8.SP.1		∞
Chapter 12 Using Probability		Traditional 12 days Block 6 days		
12-1	Probability	7.SP.5, 7.SP.6, 7.SP.7.a	*	*
12-2a	Activity Lab: Exploring Experimental Probability	7.SP.7, 7.SP.7.b	*	*
12-2	Experimental Probability	7.SP.6, 7.SP.7, 7.SP.7.b	*	*
12-2b	Activity Lab: Random Numbers	7.SP.7, 7.SP.7.b	*	*
12-3	Sample Spaces	7.SP.8, 7.SP.8.b	*	*
12-4	Compound Events	7.SP.8, 7.SP.8.a, 7.SP.8.b, 7.SP.8.c	*	*
CC-14	Simulating Compound Events	7.SP.8.c	*	*
12-5	Permutations			∞
12-6	Combinations			∞

Common Core Supplemental Lessons

Prentice Hall Course 2

The supplemental lessons listed below are available for *Prentice Hall Course 2*. These lessons ensure comprehensive coverage of all of the Grade 7 Standards for Mathematical Content that are in Common Core State Standards.

CC-1 Adding and Subtracting Rational Numbers

CC-2 Multiplication with Rational Numbers

CC-3 Division with Rational Numbers

CC-4 Simplifying Expressions

CC-5 Solving Equations of the Form $p(x+q)=r$

CC-6 Solving Inequalities

CC-7 Unit Rates and Ratios of Fractions

CC-8 Drawing Triangles

CC-9 Cross Sections

CC-10 Graphs and Proportional Relationships

CC-11 Constant of Proportionality

CC-12 Data Variability

CC-13 Random Samples

CC-14 Simulating Compound Events

CC-1

Addition and Subtraction With Rational Numbers



CONTENT STANDARDS

7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

7.NS.1.c Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

7.NS.1.d Apply properties of operations as strategies to add and subtract rational numbers.

GO for Help

to Lesson 1-7

You already know how to add and subtract integers. The table shows the rules, where a, b, c , and d are positive integers and $a > b$.

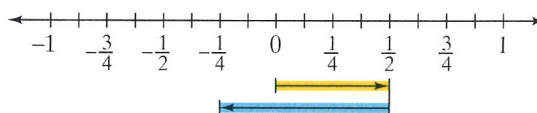
	Same Sign	Different Sign
Add: The sum has the sign of the addend with greater absolute value.	$a + b = c$ $-a + (-b) = -c$	$a + (-b) = d$ $-a + b = -d$
Subtract: Rewrite as adding the additive inverse.	$a - b = a + (-b) = d$ $-a - (-b) = -a + b = -d$	$a - (-b) = a + b = c$ $-a - b = -a + (-b) = -c$

You also know how to add positive decimals, fractions, and mixed numbers. Use these skills to add and subtract any rational numbers.

ACTIVITY

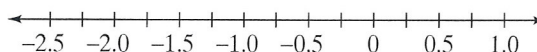
MATHEMATICAL PRACTICES

- The sum $\frac{1}{2} + \left(-\frac{3}{4}\right)$ can be represented on a horizontal number line diagram.

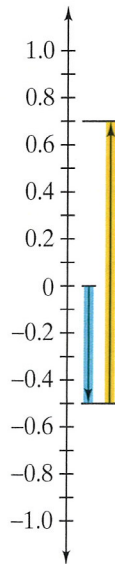


Copy the number line diagram and label the parts that represent $\frac{1}{2}$ and $\left(-\frac{3}{4}\right)$.

- What is the sum of these two fractions?
- Can you use the same number line diagram to represent $\frac{1}{2} - \frac{3}{4}$?
- Represent each sum or difference on a horizontal number line. Then find each sum or difference.
 - $-\frac{3}{4} + \frac{5}{8}$
 - $\frac{1}{4} - \left(-\frac{3}{4}\right)$
 - $\frac{3}{4} + \left(-\frac{1}{2}\right)$
 - $-\frac{1}{4} - \frac{5}{8}$
- Use a horizontal number line like the one below to represent the sum of $-2.25 + 1.75$.



Use after Lesson 3-3.



6. The vertical number line at the left represents $-0.5 - (-1.2)$.
 - a. How else could you write this expression?
 - b. What is the value of this expression?
7. Represent $-1\frac{1}{4} - 5\frac{1}{2}$ on a vertical number line diagram and find the difference.

ACTIVITY



The altitude at sea level is 0 meters. A scuba diver is standing on a platform 3.1 meters above sea level on a boat in the ocean.

1. Draw a diagram. At what altitude are the diver's feet?
2. The diver jumps into the water and stops at the top of a kelp plant 8.25 meters below sea level. Add this information to your diagram.
3. Find the absolute value of the difference between 3.1 and -8.25 to determine the distance the diver descended.
4. The diver follows the kelp plant down to its base at 21.3 meters below sea level. Complete your diagram.
5. Simplify the expression $3.1 - (-21.3)$ to find the total distance the diver descended.

Exercises

Represent each sum or difference on a horizontal or vertical number line diagram. Then find each sum or difference.

- | | | |
|-------------------|---|----------------------------------|
| 1. $3.5 + (-2.8)$ | 2. $-\frac{3}{4} + \left(-\frac{7}{8}\right)$ | 3. $-2.8 + 3.5$ |
| 4. $2.1 - (-1.7)$ | 5. $-1\frac{5}{8} - \left(-4\frac{3}{8}\right)$ | 6. $1\frac{1}{4} - 2\frac{7}{8}$ |

Add or subtract the following rational numbers.

- | | | |
|---|---------------------|---|
| 7. $-16 - 26.6$ | 8. $-15.2 + 15.2$ | 9. $-9\frac{4}{5} - 4\frac{3}{5}$ |
| 10. $15\frac{1}{5} - \left(-15\frac{1}{5}\right)$ | 11. $-9.7 - (-8.8)$ | 12. $8\frac{3}{8} + \left(-6\frac{1}{4}\right)$ |

13. What is the temperature difference between 120°C and -50°C ?
14. It was 75.5°F at 2 P.M. and then the temperature dropped 15.1°F in an hour. What was the temperature at 3 P.M.?
15. It was -20.5°F at 6 A.M. and 22°F at noon. How much did the temperature change?

16. **Writing in Math** Explain why $p - q = p + (-q)$ is true for all rational numbers.

CC-2

Multiplication with Rational Numbers



7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

7.NS.2.a Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

7.NS.2.c Apply properties of operations as strategies to multiply and divide rational numbers.

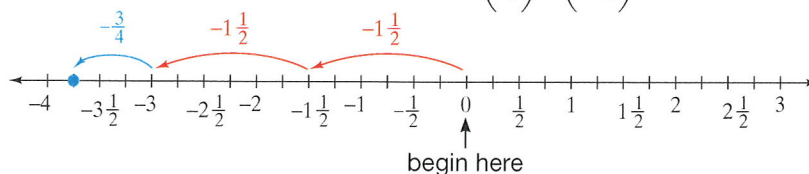
GO for Help
to Lesson 1-8.

You already know how to multiply integers. You also know how to multiply positive decimals, fractions, and mixed numbers. Use these skills to multiply rational numbers.

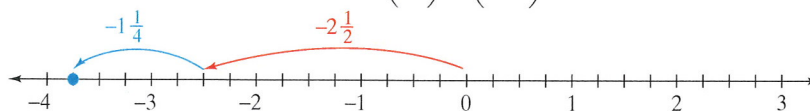
ACTIVITY



1. The model below shows the product $\left(2\frac{1}{2}\right) \cdot \left(-1\frac{1}{2}\right)$.



- Explain which property justifies why $2\frac{1}{2} \cdot \left(-1\frac{1}{2}\right)$ is equal to $2 \cdot \left(-1\frac{1}{2}\right) + \frac{1}{2} \cdot \left(-1\frac{1}{2}\right)$.
 - Explain how the number line above illustrates $2 \cdot \left(-1\frac{1}{2}\right) + \frac{1}{2} \cdot \left(-1\frac{1}{2}\right)$.
 - What is the sum of $2\frac{1}{2}$ groups of $-1\frac{1}{2}$?
 - What is the product $\left(2\frac{1}{2}\right) \cdot \left(-1\frac{1}{2}\right)$?
2. How does this model show $\left(1\frac{1}{2}\right) \cdot \left(-2\frac{1}{2}\right)$?



- Compare $2\frac{1}{2} \cdot \left(-1\frac{1}{2}\right)$ and $1\frac{1}{2} \cdot \left(-2\frac{1}{2}\right)$.
 - What is true about the product of these expressions?
 - Is $2\frac{1}{2} \cdot \left(-1\frac{1}{2}\right)$ the same as $(1) \cdot \left(2\frac{1}{2}\right) \cdot (-1) \cdot \left(1\frac{1}{2}\right)$? Explain.
 - Why does each expression equal $(1) \cdot (-1) \cdot \left(1\frac{1}{2}\right) \cdot \left(2\frac{1}{2}\right)$?
 - What is the sign of $(1)(-1)$?
 - Why is the product of a positive rational number and a negative rational number negative?

Use after Lesson 3-4.

4. a. Write the expression $(-2.2)(-0.45)$ as a product of four factors that includes $(-1)(-1)$.
 b. What is the product of $(-2.2)(-0.45)$?
 c. Explain how finding the sign of the product of two rational numbers is similar to finding the sign of the product of two integers.

ACTIVITY

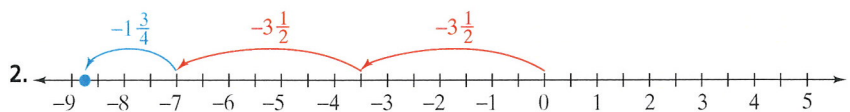
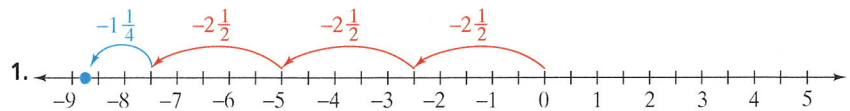


Jolene graduated from college last year and is repaying her student loan. Every month she makes a payment of \$124.18 from her checking account.

1. Does each payment increase or decrease her checking account balance?
2. Jolene has paid 7 months of her loan so far. Simplify the expression $(-124.18) \times 7$ to determine the change to her checking account balance caused by these seven loan payments.
3. Jolene gets a promotion and decides to pay 4.5 months of loan payments in advance. Write an expression to represent the change this will make to her checking account balance.
4. How much will she pay in advance toward the loan?
5. What is the sign of your answer? Explain why.

Exercises

Describe the product each number line models.



3. **Writing in Math** Use properties of mathematics to explain why the products in Exercises 1 and 2 have the same value.
4. For the past three months, Arturo's phone bill was \$58.93 each month. He made each payment from the same checking account. How much did these payments change his account balance?

Phone Bill

Total: \$58.93

Find each product.

5. $3.5 \cdot (-2.4)$
6. $-16 \cdot 6.6$
7. $-1\frac{5}{8} \cdot \left(-3\frac{1}{7}\right)$
8. $-2\frac{1}{3} \cdot -1\frac{3}{4}$
9. $-5.2 \cdot (-5.2)$
10. $3\frac{2}{5} \cdot -3\frac{1}{3}$

CC-3

Division with Rational Numbers



CONTENT STANDARDS

7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

7.NS.2.b ...Interpret quotients of rational numbers by describing real-world contexts.

7.NS.2.c Apply properties of operations as strategies to multiply and divide rational numbers.

You already know how to divide integers.

Two Numbers	Sign of Quotient	Examples
Same Sign	Quotient is positive.	$16 \div 2 = 8$ $-16 \div (-2) = 8$
Opposite Signs	Quotient is negative.	$-16 \div 2 = (-8)$ $16 \div (-2) = (-8)$

You also know how to divide positive decimals, fractions, and mixed numbers. Use these skills to divide rational numbers.

ACTIVITY



1. Write the division problem $-3\frac{1}{3} \div 2\frac{1}{3}$. Will the sign of the quotient be positive or negative? Why?
2. Rewrite each mixed number as an improper fraction.
3. Rewrite the division problem as a multiplication problem. To divide by a fraction, multiply by its reciprocal.
4. What is the product? Write your answer as a mixed number.
5. When dividing two numbers with opposite signs, does it matter which number is negative and which number is positive? Use properties of operations to justify your answer.

ACTIVITY



Denise takes her father's old bicycle to a mechanic to have it restored. Afterwards, the mechanic sends her a bill with the charges shown.

Repair Bill

Tune-up	\$50.00
Brake Shoes	\$15.42
Tires	\$34.19
Drive Train	\$105.50

1. Find the sum of the charges on the bill.
2. From Denise's point of view, money that she receives is a positive number, and money that she owes is a negative number. To Denise, is the sum of the charges on the bill positive or negative? Explain.

Use after Lesson 3-5.

3. The mechanic wants full payment of the bill in four and a half months. Write an expression for how Denise's checking account will change each month.
4. What does the sign of the quotient represent?
5. What does the quotient tell Denise about paying her bill?
6. Next year, Denise has two more parts replaced. She uses a \$25 gift card to pay for part of the work. Her expenses are shown below.

−\$54.50

−\$62.75

+\$25.00

What is the sum?

7. If Denise pays off the bill in 15 weeks, or 3.75 months, how much will her checking account change per month?

Exercises

Find each quotient.

1. $-14.28 \div 4.2$

2. $14.28 \div 4.2$

3. $14.28 \div (-4.2)$

4. $-2\frac{3}{4} \div 11$

5. $2\frac{3}{4} \div 11$

6. $2\frac{3}{4} \div (-11)$

7. $-\frac{3}{8} \div \left(-1\frac{1}{10}\right)$

8. $-10.5 \div (-0.5)$

9. $-12.96 \div (-10.8)$

10. $3\frac{1}{2} \div -2\frac{2}{3}$

11. How does the quotient $10.8 \div (-2.4)$ compare to the quotient $-10.8 \div 2.4$?
12. A spreadsheet program uses rational numbers to keep track of income and expenses for a business.

Business Expenses and Income

	Phone	Supplies	Wages	Income
Monday	−\$4.32	\$0.00	−\$135.50	\$0.00
Tuesday	−\$4.32	−\$17.25	−\$135.50	\$782.00
Wednesday	−\$4.32	\$0.00	−\$135.50	\$525.00
Thursday	−\$4.32	−\$25.00	−\$135.50	\$782.00
Friday	−\$4.32	−\$9.25	−\$135.50	\$0.00

- a. What is the total balance for Monday?
- b. Find the total balance for each other day of the week.
- c. What is the average daily balance?

CC-4

Simplifying Expressions



7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

You evaluate algebraic expressions by substituting values for variables. To simplify algebraic expressions, use properties of operations.

Like terms are terms that have the same variable factors. For example, $12x$ and $3x$ are like terms, but $4a$ and $5b$ are not like terms. You can use the properties of operations to order, group, and combine like terms.

EXAMPLE Using Properties to Add and Subtract

1

Simplify $5x + 9 + 2x - 4$.

$$\begin{aligned} &5x + 9 + 2x - 4 && \leftarrow \text{Identify which parts of the expression are like terms.} \\ &= 5x + 2x + 9 - 4 && \leftarrow \text{Commutative Property of Addition} \\ &= (5 + 2)x + 9 - 4 && \leftarrow \text{Distributive Property} \\ &= 7x + 9 - 4 && \leftarrow \text{Simplify the coefficient.} \\ &= 7x + 5 && \leftarrow \text{Simplify.} \end{aligned}$$

The simplified expression is $7x + 5$.

Quick Check

1. Simplify each expression.

a. $2x + 8 + 4x - 5$ b. $6 + 7y - 4y + 1$ c. $10r - 5 + 3 + r$

Sometimes an expression should be expanded before it can be simplified.

EXAMPLE Expanding Expressions

2

Simplify $3(5w + 8) - 6$.

$$\begin{aligned} &3(5w + 8) - 6 \\ &= (15w + 24) - 6 && \leftarrow \text{Distributive Property} \\ &= 5w + (24 + (-6)) && \leftarrow \text{Associative Property of Addition} \\ &= 15w + 18 && \leftarrow \text{Simplify.} \end{aligned}$$

The simplified expression is $15w + 18$.

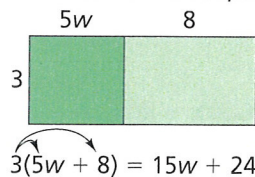
Quick Check

2. Simplify each expression.

a. $6(2x + 3) - 4$ b. $2(1 - 8v) + 5$ c. $9 - 4(3z + 2)$

Test Prep Tip

The model illustrates the Distributive Property.



Use after Lesson 4-1.

EXAMPLE Factoring Expressions

3 Factor $4x + 14$.

GCF of 4 and 14 is 2.

← Identify the GCF.

$$4x + 14 = 2 \cdot 2x + 2 \cdot 7$$

← Factor each term by the GCF.

$$= 2(2x + 7)$$

← Distributive Property

The factored expression is $2(2x + 7)$.

Quick Check

3. Factor each expression completely.

a. $9x + 15$

b. $36 + 24t$

c. $8c - 20$

Homework Exercises

GO for Help

For Exercises	See Examples
1–9	1–2
10–12	3

GPS

Simplify each expression.

1. $9x + 3 + 2x - 2$

2. $6y + 7 - 3y + 3$

3. $12w - 7 + 1 + 4w$

4. $4 - 6x + 8 + 3x$

5. $3a + 8 + a - 9 - 2a$

6. $4(5x + 2) - 6$

7. $10 + 3(2v - 3)$

8. $4 - 5(3t + 3)$

9. $6(y + 2) - 6 + 5y$

Factor each expression completely.

10. $6x + 10$

11. $30 + 20y$

12. $12x - 28$

13. **Guided Problem Solving** Simplify $\frac{6x + 4}{2}$.

• **Make a Plan** Rewrite the quotient as a product. Apply the Distributive Property. Write all fractions in simplest form.

• **Carry Out the Plan**

$$\frac{6x + 4}{2} = \frac{1}{2}(6x + 4) = \frac{1}{2} \cdot 6x + \frac{1}{2} \cdot 4 = 3x + 2$$

Simplify each expression.

14. $\frac{24x + 16}{8}$

15. $\frac{15 + 36y}{3}$

16. $\frac{96b - 24}{12}$

17. **Writing in Math** The expression $3x - 6 + 2x + 4$ is modeled with algebra tiles as shown.



Explain how to use the model to simplify the expression.

Simplify each expression.

18. $8.4x + 10.2 + 4.3x - 2.9$

19. $5y + 4.7 + 2.08 - 0.6y$

20. $\frac{2}{3}(8x + 12) - \frac{4}{3}$

21. $1 + \frac{1}{2}x - \frac{3}{4}\left(\frac{1}{6} - \frac{2}{9}x\right)$

22. **Error Analysis** Jane did the work shown. Explain her error.

$$\begin{aligned} &9y - 2 + 4y \\ &9y - 4y + 2 \\ &5y + 2 \end{aligned}$$

CC-5

Solving Equations of the Form $p(x + q) = r$



CONTENT STANDARDS

7.EE.4.a Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

You can use the Distributive Property to solve equations in the form $p(x + q) = r$.

EXAMPLE Solve Using the Distributive Property

Solve $10(a - 6) = -25$.

$$10(a) + 10(-6) = -25$$

← Use the Distributive Property.

$$10a - 60 = -25$$

← Simplify.

$$10a = 35$$

← Add 60 to both sides.

$$a = 3.5$$

← Divide both sides by 10.



Quick Check

Solve these equations.

$$1. -4.5 = -3(b - 15)$$

$$2. 8\frac{1}{2}(c - 16) = 340$$

More Than One Way



Each of 4 workers in a gourmet bakery makes $2\frac{1}{2}$ pounds of cranberry granola every day. The workers also make almond granola. Together, they make 24 pounds of granola every day. How many pounds of almond granola does each worker make daily?

Sarah's Method

I can use number sense. The amount of cranberry granola made daily is $4 \times 2\frac{1}{2}$ or 10 pounds. Since $24 - 10 = 14$ and $14 \div 4 = 3\frac{1}{2}$, each worker makes $3\frac{1}{2}$ pounds of almond granola daily.

Ryan's Method

I can write an equation. Let b represent the pounds of almond granola that each worker makes. Together, the workers make $4(2\frac{1}{2} + b)$ pounds of granola.

$$4\left(2\frac{1}{2} + b\right) = 24$$

$$10 + 4b = 24$$

← Use the Distributive Property.

$$4b = 14$$

← Subtract 10 from both sides.

$$b = 3\frac{1}{2}$$

← Divide both sides by 4.

Each worker makes $3\frac{1}{2}$ pounds of almond granola daily.

Use after Lesson 4-6.

Compare the Methods

1. Compare the sequence of operations in Ryan's and Sarah's methods. Explain how they are alike and how they differ.
2. Which method do you prefer? Can you improve on that method?

Homework Exercises

GO for Help

For Exercises	See Example
1–10	1

GPS

Solve.

1. $-8(x + 2) = -10$
2. $10(2.2 - b) = 15.2$
3. $10\left(c + 6\frac{1}{5}\right) = -102$
4. $3\frac{2}{3}(12 - a) = 43$
5. $17\frac{5}{8} = -2(x + 15)$
6. $4(m + 2.5) = 7.5$
7. $14(0.5 + k) = -14$
8. $3(0.2 + y) = 9.6$
9. $100(a - 4.5) = 350$
10. $138.75 = 9.25(-6 + t)$

11. **Guided Problem Solving** Sandra buys a kit that has exactly enough material to replace the seats and backs of two antique chairs. The seats and backs are woven from cane. Each seat uses $83\frac{1}{3}$ yards of cane. If the kit has $416\frac{2}{3}$ yards of cane, how much is provided for each back?
- Each chair seat is made from $83\frac{1}{3}$ yards of cane. Write an expression that represents the amount of cane for one chair.
 - Write an expression that represents the cane for both chairs.
 - Write an equation that represents the situation and solve it.

12. **Food Preparation** Annie made fruit punch for 12 people. The punch contains sparkling water and $\frac{2}{3}$ pint of fruit juice per person. If there are $10\frac{2}{5}$ pints of fruit punch, how many pints of sparkling water did Annie add per person?

13. **Algebra** Write and solve an equation using the distributive property modeled by the algebra tiles below.



14. **Cell Phone** Paulo pays \$45.99 per month for unlimited calls, with additional charges for text messages. His bill for 4 months is \$207.96. If he sends 100 texts each month, how much is he charged per text?
15. **Writing in Math** Is it possible to solve the equation $5(b - 2) = 20$ by first dividing each side by 5? Explain.

CC-6

Solving Inequalities



CONTENT STANDARDS

7.EE.4.b Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers.

Test Prep Tip

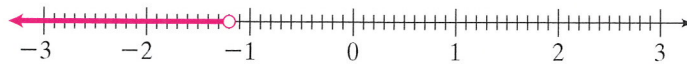
Reverse the direction of the inequality symbol when you multiply or divide each side of an inequality by a negative number.

To solve two-step inequalities you follow the same steps as solving two-step equations. The solution can be graphed on a number line.

EXAMPLE Solving Two-Step Inequalities

- 1** Solve $-3.5x + 6 > 10.2$. Graph the solution.

$$\begin{aligned} -3.5x + 6 &> 10.2 && \leftarrow \text{Write the inequality.} \\ -3.5x + 6 - 6 &> 10.2 - 6 && \leftarrow \text{Subtract 6 from each side.} \\ -3.5x &> 4.2 && \leftarrow \text{Simplify.} \\ \frac{-3.5x}{-3.5} &< \frac{4.2}{-3.5} && \leftarrow \text{Divide each side by } -3.5. \\ x &< -1.2 && \leftarrow \text{Simplify.} \end{aligned}$$



Quick Check

- 1.** Solve $-\frac{1}{3}a + \frac{1}{2} \leq \frac{1}{5}$. Graph the solution on a number line.

EXAMPLE Application: Music Downloads

- 2** A music club charges \$0.75 per song download plus a membership fee of \$5.70. Diego can spend at most \$15. Write and graph the inequality for the number of songs Diego can download.

Words \$0.75 times number of songs plus monthly fee is at most \$15



Let s = the number of songs

Expression $0.75 \cdot s + 5.7 \leq 15$

$$\begin{aligned} 0.75s + 5.7 &\leq 15 && \leftarrow \text{Write the inequality.} \\ 0.75s + 5.7 - 5.7 &\leq 15 - 5.7 && \leftarrow \text{Subtract 5.7 from each side.} \\ 0.75s &\leq 9.3 && \leftarrow \text{Simplify.} \\ \frac{0.75s}{0.75} &\leq \frac{9.3}{0.75} && \leftarrow \text{Divide each side by 0.75.} \\ s &\leq 12.4 && \leftarrow \text{Simplify.} \end{aligned}$$



Only whole-number solutions are reasonable in this context, so Diego can download at least 0 songs and no more than 12 songs.

Use after Lesson 4-9.

Quick Check

2. A phone plan charges \$0.20 per text message plus a monthly fee of \$42.50. Lin can spend at most \$50. Write an inequality for the number of text messages Lin can send. Graph and describe the solutions.

Homework Exercises

GO for Help

For Exercises	See Examples
1–9	1
10	2

GPS

Solve each inequality. Graph the solution.

- $-1.6x + 5 > 7.4$
- $3.7y + 2.8 \geq 25$
- $-5.6c - 7.2 \leq 6.8$
- $2.4w - 7.1 < 8.5$
- $-\frac{5}{7} - \frac{6}{7}z < -\frac{2}{7}$
- $-9.4x + 6 > -8.1$
- $\frac{x}{5} + \frac{1}{2} \geq \frac{1}{10}$
- $-\frac{3}{4}y - \frac{3}{8} < \frac{1}{8}$
- $\frac{d}{3} - \frac{1}{6} > \frac{1}{12}$

10. Tricia receives a \$5 allowance every week. She also earns \$6.50 for every hour that she baby-sits. Next week she wants to earn at least \$21.25 to buy a present. Write an inequality to find the number of hours she needs to baby-sit. Graph and describe the solutions.

11. **Guided Problem Solving** Kate sells bracelets at a craft fair and earns \$9.60 per bracelet. She pays a rental fee of \$35.20 for her booth. She wants to earn at least \$200. Write an inequality to find the number of bracelets Kate needs to sell. Graph and describe the solutions.

- Make a Plan** Complete the chart below:

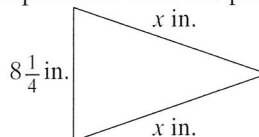
Words times number of bracelets minus rental fee is at least

Let b = the number of bracelets

Expression · -

- Carry Out the Plan** Solve the inequality. Graph and describe the solutions.

12. Darrell wants to make a pennant with the pattern shown.



He has 4 feet of gold trim. Write an inequality for the value of x so that there is enough gold trim to go around all three edges of the pennant. Graph and describe the solutions.

13. **Writing in Math** Randy wants a snack with no more than 200 calories. He includes some cherries that have 5 calories each and a banana that has 121 calories. Randy writes the inequality $5c + 121 \leq 200$ to describe the number of cherries c he can eat. Describe the steps Randy must take to determine the value of c .

CC-7

Unit Rates and Ratios of Fractions

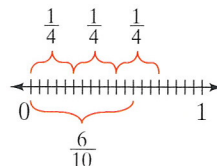


7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

You know how to find unit rates using whole numbers and decimals. You can also find unit rates from data expressed as fractions.

EXAMPLE Determining Unit Rates

- 1 Cindy walks $\frac{6}{10}$ mile in $\frac{1}{4}$ hour. Over that distance, what is her speed in miles per hour?



$$\begin{aligned}
 \text{miles} \div \text{hour} &= \frac{6}{10} \div \frac{1}{4} && \leftarrow \text{Divide miles by hours.} \\
 &= \frac{6}{10} \cdot \frac{4}{1} && \leftarrow \text{Multiply by } \frac{4}{1}, \text{ the reciprocal of } \frac{1}{4}. \\
 &= \frac{6}{5} \cdot \frac{4}{1} && \leftarrow \text{Divide 10 and 4 by their GCF, 2.} \\
 &= \frac{12}{5} && \leftarrow \text{Multiply.} \\
 &= 2\frac{2}{5} && \leftarrow \text{Write as a mixed number.}
 \end{aligned}$$

Cindy walks $2\frac{2}{5}$ miles per hour.

Quick Check

1. Find the unit rate.
 - a. $\frac{3}{10}$ mile in $\frac{3}{4}$ hour
 - b. $\frac{7}{8}$ container in $\frac{1}{2}$ minute

Unit rates can be used for many comparisons.



EXAMPLE Scale Factors

- 2 How many inches on the map equal 1 mile?
Think: How many inches per mile? Set up a division expression.

$$\begin{aligned}
 \text{inches} \div \text{mile} &= \frac{1}{4} \div \frac{5}{8} && \leftarrow \text{Divide inches by miles.} \\
 &= \frac{1}{4} \cdot \frac{8}{5} && \leftarrow \text{Multiply by } \frac{8}{5}, \text{ the reciprocal of } \frac{5}{8}. \\
 &= \frac{1}{4} \cdot \frac{8}{5} && \leftarrow \text{Divide 4 and 8 by their GCF, 4.} \\
 &= \frac{2}{5} && \leftarrow \text{Multiply.}
 \end{aligned}$$

So, $\frac{2}{5}$ inch on the map equals 1 mile.

Use after Lesson 5-2.

Quick Check

2. A map scale is $\frac{1}{4}$ inch = $\frac{2}{5}$ mile. How many inches represent 1 mile?

Homework Exercises

GO for Help

For Exercises	See Examples
1–4	1
5–8	2

Find the unit rate.

- $\frac{1}{2}$ dozen pencils in $\frac{1}{3}$ box
- $\frac{4}{5}$ chapter in $\frac{1}{4}$ hour
- $\frac{3}{5}$ page in $\frac{3}{4}$ minute
- $\frac{7}{12}$ gallon in $\frac{3}{10}$ kilometer

Convert the scale to a unit rate. Label your answer.

- $\frac{1}{4}$ in. = $\frac{3}{4}$ mi
- $\frac{3}{8}$ in. = $\frac{3}{4}$ yd
- $\frac{7}{10}$ cm = $\frac{5}{6}$ km
- $\frac{3}{10}$ cm = $\frac{2}{5}$ km



9. **Guided Problem Solving** In a science experiment, $16\frac{1}{2}$ grams of a powdered substance must be added to a liquid uniformly during exactly 1 minute 45 seconds. What is this rate in grams per minute?

- Write 1 minute 45 seconds as a mixed number of minutes.
- Write both numbers as improper fractions.

10. **Equestrian** Rayelle's horse can run $2\frac{1}{2}$ laps in 3 minutes 6 seconds. What is this rate in laps per minute?

11. How many centimeters equal 1 kilometer on the map?



Find the unit rate.

- $2\frac{1}{2}$ miles in $11\frac{1}{2}$ minutes
- $2\frac{1}{5}$ sandwiches in $4\frac{2}{5}$ minutes
- $3\frac{1}{4}$ baskets in $2\frac{1}{2}$ days
- $3\frac{3}{8}$ cups in $1\frac{1}{2}$ servings
- Oren is tiling a bathroom. He uses $72\frac{1}{4}$ tiles in $8\frac{1}{2}$ rows to complete the floor. What is the unit rate in tiles per row?
- Landscaping** A landscaper used $\frac{1}{10}$ pound of fertilizer in the soil for every $22\frac{1}{3}$ square feet of lawn. What is the unit rate in pounds per square foot?
- Maxine can peel, core, and cut $\frac{3}{4}$ pound of apples in $2\frac{1}{2}$ minutes. What is Maxine's unit rate in pounds per hour?

19. **Writing in Math** Arturo can paint $\frac{1}{2}$ of a room in $2\frac{1}{2}$ hours. Explain how to calculate two different unit rates using this data.

20. **Open-Ended** Write a scenario and find the unit rate:

$$1\frac{2}{3} \text{ pint in } \frac{1}{6} \text{ square meter}$$

CC-8

Drawing Triangles



CONTENT STANDARDS

7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

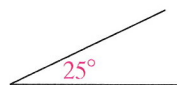
Every triangle has three measures of angles and three measures of sides. A triangle is unique if there is exactly one triangle that can be determined from given measures.

ACTIVITY



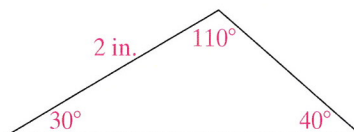
MATHEMATICAL PRACTICES

1. a. Use a ruler to draw a line segment. Measure and draw a 25° angle at one end of the line segment such as the one below.

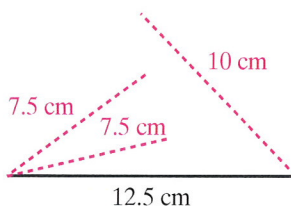


Complete your triangle by drawing a line segment that intersects the other two line segments at 50° and 105° .

- b. Compare triangles with a classmate. Are your triangles the same?
- c. Do three angle measures determine a unique triangle? Explain.
2. a. Construct a triangle with angle measures of 30° , 40° , and 110° and a 2-inch side length. Describe the steps you followed.
- b. Compare your triangle with the triangle below. Are the triangles the same or different? Explain.



- c. Do three angle measures and a side measure determine a unique triangle? Explain.
3. a. One student started constructing a triangle, as shown below, with side lengths of 7.5 cm, 10 cm, and 12.5 cm. What information is not given? Why is this construction challenging?



- b. Choose available tools and try to construct the triangle.
- c. Describe the strategy you used, explaining why you chose the tools that you did for the construction.

Use after Lesson 7-3.

- d. Can triangles with the same three side measures have different shapes? Explain your reasoning.
- e. Is a triangle unique when only three side measures are given?

ACTIVITY



1. Cut straws to lengths of 2 cm, 3 cm, 4 cm, 5 cm, and 6 cm. For each combination of 3 straws, identify the type of a triangle you can make using three straws: unique, more than one, or none. Make a table to list the combinations.

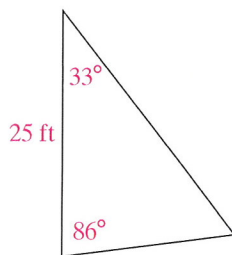
Lengths	Type of Triangle
2 cm, 3 cm, and 4 cm	Unique
2 cm, 3 cm, and 5 cm	None

2. Is it possible to construct two different triangles using the same set of three straws? Explain.
3. Do you notice any similarities about the lengths of the straws when you cannot make a triangle?

Exercises

1. The table shows three measures for five triangles. Tell whether each determines a unique triangle, more than one triangle, or no triangle.

Triangle	Measure 1	Measure 2	Measure 3
A	75°	70°	35°
B	10 cm	6 cm	3 cm
C	7 cm	7 cm	9 cm
D	6 in.	5 in.	40°
E	36°	49°	4 in.



2. The triangle at the left has 25-foot side and angle measures of 33° and 86° . How many different triangles also have a side measuring 25 feet and angle measures of 33° and 86° ? Explain.
3. Draw each shape.
 - a. a parallelogram with angle measures of 45° and 135°
 - b. a hexagon with sides that all have a measure of 1 inch
 - c. a rhombus with a side length of 3 cm and an 80° angle
 - d. a trapezoid with one side 2 inches long and two 90° angles
4. **Writing in Math** Write directions telling how to use a ruler and a protractor to construct a unique triangle that has a side measuring 4 centimeters that connects two angles with measures of 50° and 95° .

CC-9

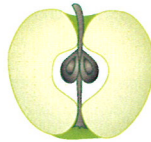
Cross Sections



7.G.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

A **cross section** is the two-dimensional shape that you see after slicing through a three-dimensional object.

cross section of an apple



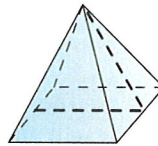
cross section of a tree trunk



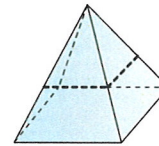
ACTIVITY



1. Jim made a clay model of a square pyramid. He shows the cross section of the pyramid by slicing the pyramid with a string.



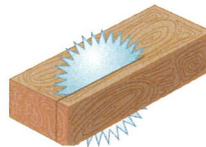
Vertical Slice



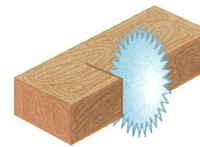
Horizontal Slice

- a. Sketch the two-dimensional shape that will result if Jim slices the pyramid vertically. Tell how you determined the shape.
 - b. Sketch the two-dimensional figure that will result if Jim slices the pyramid horizontally. Tell how you determined the shape.
2. Ripping refers to cutting wood with the grain of the wood, and crosscutting refers to cutting wood across the grain of the wood.

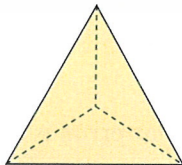
Ripping



Crosscutting



- a. Identify the two-dimensional shape of the cross section for each type of cut and compare them.
 - b. Would any other cuts produce a cross section in the same geometric shape? If so, describe how the cut would be made.
3. You have a block of cheese in the shape shown at the left.
 - a. What shape will the slice of cheese be if the cheese is sliced horizontally?
 - b. What shape will the slice of cheese be if the cheese is sliced vertically?
 - c. Does it matter where the cuts are made? Explain your reasoning.



Use after Lesson 8-8.

4. Jorge and Patti both bought sushi rolls for lunch. The sushi rolls were shaped like cylinders. Jorge cut his sushi roll vertically, and Patti cut her sushi roll horizontally as shown below.



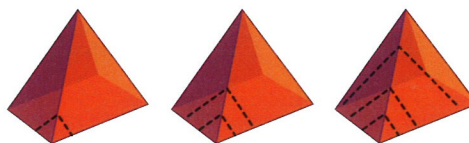
They compared the shapes of the cross sections that resulted from the cuts. Describe what they saw.

5. Sasha cut an orange shaped like a sphere through the center. What shape is the cross section that she sees?



Exercises

1. Parallel vertical slices are made through a rectangular pyramid as shown below.



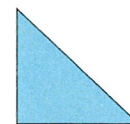
What are the shapes of the cross sections? Describe how the cross sections will change as additional cuts are made.

2. A barn silo has the shape of the figure shown at the left.
a. If it is sliced in half with a vertical cut, what geometric shapes make up the cross section?



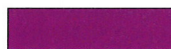
- b. **Writing in Math** Discuss how the two-dimensional shapes that make up the cross section relate to the three-dimensional shapes that make up the silo.

3. What three-dimensional figure can have a cross section in the same shape as the triangle shown at the right? Explain your reasoning.



4. A three-dimensional figure has a rectangular vertical cross section and a horizontal cross section in the shape of a hexagon.

vertical
cross section



horizontal
cross section



What is the three-dimensional figure?

5. **Reasoning** A cross section of a rectangular prism is a rectangle with sides measuring 5 cm and 7 cm. Can the exact dimensions of the prism be determined? Explain your reasoning.

CC-10

Graphs and Proportional Relationships



CONTENT STANDARDS

7.RP.2.a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

7.RP.2.d Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.

You can use tables and graphs to decide whether or not two quantities have a proportional relationship.

ACTIVITY



The tables below show a person's earnings at the end of each year at two different banks on a deposit of \$100 over a five-year period. For each bank, earnings include simple interest paid annually at the same rate each year. In addition, Bank B gives depositors a \$5 bonus when an account is first opened.

Bank A					
Years	1	2	3	4	5
Earnings	\$2	\$4	\$6	\$8	\$10

Bank B					
Years	1	2	3	4	5
Earnings	\$7	\$9	\$11	\$13	\$15

- For each bank, find the ratio comparing years to earnings for all pairs of values in the table. What do you notice about the ratios?
- Make a graph for each bank, plotting all the values in each table on a coordinate grid.
- Extend the lines. What are the earnings at each bank for year 0?
- How are the graphs different?
- For each bank, determine if years and earnings are proportional. Explain your answer using the tables and the graphs from Step 2.
- Information for earnings at Banks C and D is given below.

Bank C					
Years	1	2	3	4	5
Earnings	\$3	\$6	\$9	\$12	\$15

Bank D					
Years	1	2	3	4	5
Earnings	\$7	\$10	\$13	\$16	\$19

How much does Bank D give as a bonus for opening an account?

- Find the ratio comparing years to earnings for all pairs of values in each table.
- Make a graph for Bank C and Bank D.
- Look for patterns between the tables for all four banks. Give a general rule for using a table to decide if two quantities are proportional.
- Look for patterns between the graphs for all four banks. Give a general rule for using a graph to decide if two quantities are proportional.

Use after Lesson 10-3.

ACTIVITY



Keisha and Dave are riding in a bike-a-thon. The tables below show distances they traveled.

Keisha					
Hours	0	2	4	5	7
Miles	0	13	26	32.5	45.5

Dave					
Hours	0	3	6	8	9
Miles	0	18.6	37.2	49.6	55.8

- For each cyclist, graph the relationship between distance and time.
- Is there a proportional relationship between time and distance for either or both cyclists? Explain.
- What does the point (4, 26) represent?
- What is the meaning of the point (0, 0) in this situation?
- Where $x = 1$ on each graph, what does the y value represent?
- In the graph of any proportional relationship, what is represented by r at the point (1, r)?
- How does r compare with the unit rate for each cyclist?

Exercises

For Exercises 1–6, determine whether there is a proportional relationship. Explain your reasoning.

1.

x	1	2	4	7	9
y	5	9	17	29	37

2.

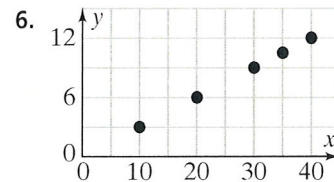
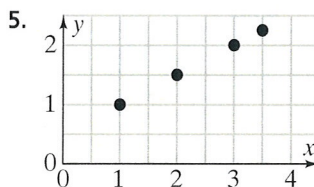
x	2	4	6	8	10
y	1.5	3	4.5	6	7.5

3.

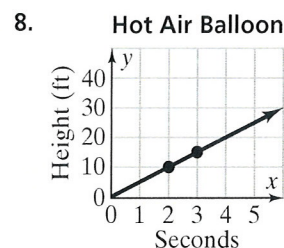
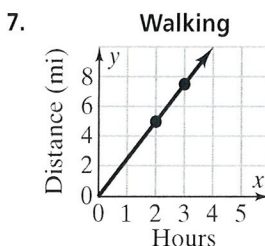
x	1	3	5	7	9
y	$\frac{7}{2}$	$\frac{21}{2}$	$\frac{35}{2}$	$\frac{49}{2}$	$\frac{63}{2}$

4.

x	1	2	3	4	5
y	2	8	16	32	64



For Exercises 7–8, explain what the point with x -coordinate 3 represents. Then find the unit rate, r .



CC-11

Constant of Proportionality



CONTENT STANDARDS

7.RP.2.b Identify the constant of proportionality (unit rate) in tables, graphs, equations, ... and verbal descriptions of proportional relationships.

7.RP.2.c Represent proportional relationships by equations.

Minutes, m	Price, p (dollars)
100	\$10
500	\$50
1,000	\$100
1,500	\$150

When the ratio of two quantities is always the same, the quantities are proportional. The value of the ratio is called the **constant of proportionality**. This value is also equivalent to the unit rate.

The graph of a proportional relationship is a straight line through the origin with a slope equal to the constant of proportionality.

EXAMPLE Identifying Unit Rate

- 1** The table at the left shows a proportional relationship between the **number of minutes** and the amount the customer pays for cell phone service. Identify the constant of proportionality.

Step 1: Use one data point to find the constant of proportionality c .

$$\frac{\text{price}}{\text{minutes}} = \frac{10}{100} \quad \leftarrow \text{Find the price per minute by dividing the price by the number of minutes.}$$

$$= 0.1 \quad \leftarrow \text{Simplify.}$$

Step 2: Check by multiplying c times the first quantity.

$$100 \times 0.1 = 10 \checkmark \quad 500 \times 0.1 = 50 \checkmark$$

$$1,000 \times 0.1 = 100 \checkmark \quad 1,500 \times 0.1 = 150 \checkmark$$

The constant of proportionality is 0.1.

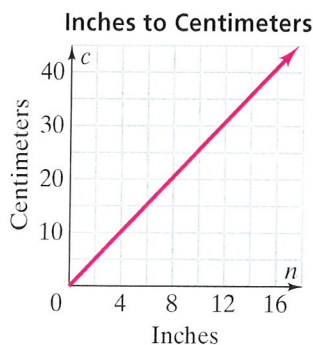
This unit rate represents a payment of \$0.10 per minute.

Quick Check

1. Find the constant of proportionality for each table of values.
- a. yards of cloth per blanket b. pay per hour

Yards (y)	16	32	40
Blankets (b)	8	16	20

Hours (h)	2	10	16
Pay (p)	\$11	\$55	\$88



EXAMPLE Representing Proportional Relationships

- 2** A ruler shows 12 inches on one edge and 30.48 centimeters on the other. The graph shows the relationship of inches to centimeters. Write a formula to find the number of centimeters c in n inches.

Step 1: Use one data point to find the constant of proportionality.

$$\frac{\text{centimeters}}{\text{inches}} = \frac{30.48}{12} \quad \leftarrow \text{To find the number of centimeters per inch, write a rate with inches in the denominator.}$$

$$= 2.54 \quad \leftarrow \text{Divide.}$$

Step 2: Write an equation for c in terms of n .

$$c = 2.54n$$

Use after Lesson 10-3.

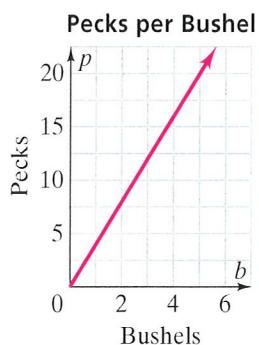
Quick Check

2. Write an equation to describe the relationship.
 - a. An inn uses 3,500 gallons of water each week. Predict the number of gallons used for d days.
 - b. Tim is paid \$58 for 8 hours. Find his wage for h hours.

Homework Exercises

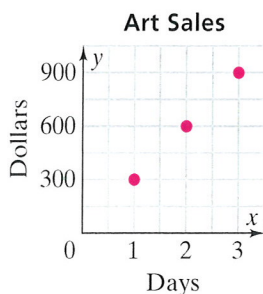
GO for Help

For Exercises	See Examples
1–4	1
5–7	2



Orange Prices

\$	\$8	\$10	\$20
lbs	4	6	10



Find the constant of proportionality for each table of values.

1. profit per shirt sold

Shirts	5	10	15
Profit	\$7.50	\$15.00	\$22.50

2. wages per day

Days	5	10	15
Wages	\$51.25	\$102.50	\$153.75

3. price per pound

Apples (lb)	4	5	6
Price	\$7.96	\$9.95	\$11.94

4. pounds per bag

Bags	3	8	11
Dog Food (lb)	7.5	20	27.5

Write an equation using the constant of proportionality to describe the relationship.

5. The graph at left shows the relationship between bushels and pecks. Find the number of pecks p in b bushels.
6. A horse that is 16 hands tall is 64 inches tall. Find the number of hands h in n inches.
7. One day, 16 U.S. dollars was worth 10 British pounds. Find the number of dollars d in p pounds.
8. **Guided Problem Solving** Distance traveled d is proportional to the travel time t at a constant rate r . Write an equation that describes the relationship between d and t .
 - What is r in terms of d and t ?
 - What equation tells how to find d given r and t ?
9. The ratio of the circumference C of a circle to its diameter d is π . Write an equation that describes the relationship between C and d .
10. **Error Analysis** A salesperson showed the table on the left while explaining that oranges are the same price per pound, no matter what size bag they come in. Why is the salesperson wrong?

Use the graph for questions 11–13.

11. What is the constant of proportionality, dollars per day?
12. Make a table of values to show the data in the graph.
13. Write an equation to find the amount for any number of days.
14. **Writing in Math** Explain how to identify the constant of proportionality from a graph of any proportional relationship.

CC-12

Data Variability



7.SP.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

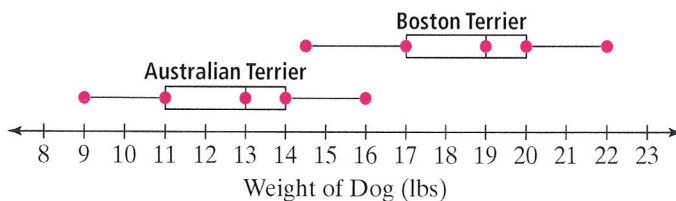
GO for Help
Activity 1-10b

Data displays can be used to assess the visual overlap of two data sets. You can compare their centers, such as mean or median, and their **variability**, the way data is spread out.

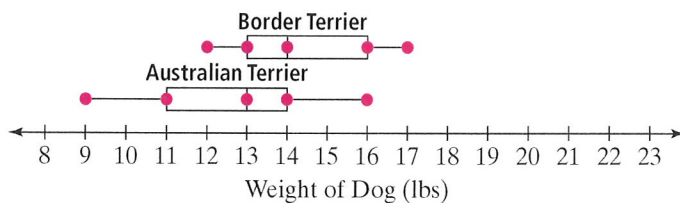
ACTIVITY



A veterinarian collects data about the weights of dogs she treats.

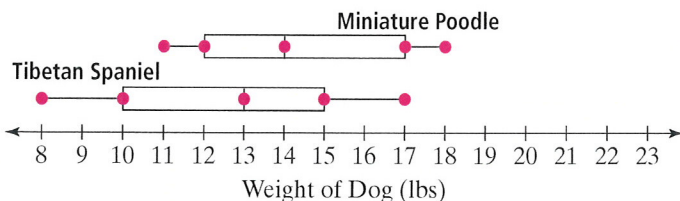


1. Do the two data sets overlap? Explain your reasoning.
2. The interquartile range (IQR) measures variability. The IQR is the difference between the upper and lower quartiles. Determine the IQR for each breed.
3. The difference between the median weights of these two breeds is 6 pounds. What number multiplied by the IQR equals 6?
4. These plots show data for Australian terriers and border terriers.



Describe the visual overlap between the two data sets.

5. Express the difference between medians as a multiple of the IQR.
6. Can you use this multiple to assess the amount of visual overlap between two data sets? Explain.
7. Box-and-whisker plots for two other breeds are shown below.



Use after Lesson 11-3.

What multiple of the IQR is the difference of medians?

ACTIVITY



- Describe the overlap of the two data sets below.

Dog Weights (lbs)		
Pug		Dachshund
X X	13	X
X X	14	
X X X	15	
X	16	X X
X	17	X X X
X	18	X X
	19	X X

- Calculate the mean of each data set.
- You can use the mean absolute deviation (MAD) to measure variability of a data set. The MAD measures the average distance from the mean to each data point. The MAD of pug weights is calculated in this table.

Weight (lbs)	13	13	14	14	15	15	15	16	17	18
Mean	15	15	15	15	15	15	15	15	15	15
Distances	2	2	1	1	0	0	0	1	2	3
MAD = Total Distances/# Weights					$\frac{12}{10} = \frac{6}{5} = 1.2$					

Copy the table below to calculate the MAD of dachshund weights.

Weight (lbs)										
Mean										
Distances										
MAD = Total Distances/# Weights										

Dog Weights (lbs)		
Pug		Miniature Dachshund
	6	X
	7	X
	8	X
	9	X X X
	10	X X X
	11	
	12	X
X X	13	
X X	14	
X X X	15	
X	16	
X	17	
X	18	

- Can you verify that the variability for both sets is the same by looking at the shape of the data? Explain your reasoning.
- What number multiplied by the MAD equals the difference between the means?
- The line plots at the left show the weights of pugs and miniature dachshunds. Describe the overlap of these two sets.
- Calculate the mean of the miniature dachshund weights. Then find the MAD.
- How does the MAD of the miniature dachshund weights compare with the MAD of pug weights?
- What number multiplied by the MAD equals the difference between these two means?
- Can you use this multiple to assess the amount of visual overlap between two data sets? Explain.

CC-13

Random Samples



CONTENT STANDARDS

7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

A random sample of a population is used to make predictions about an entire population. These predictions are called **inferences**.

ACTIVITY

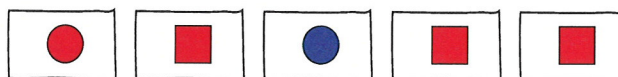


1. A deck of 100 cards has either a circle or a square on it, and the shape on the card is shaded either red or blue. Kris chose this sample of five cards:



Explain why you can use the proportion $\frac{3}{5} = \frac{x}{100}$ to predict the number of red cards in the deck.

2. Make an inference about the number of red cards in the whole deck.
3. Kris returned the cards, shuffled the deck, and chose five new cards.



Based on the results of this sample, use a proportion to make an inference about the number of red cards in the deck.

4. Kris repeated this three more times and recorded the results.

Sample	1	2	3	4	5
Red Cards	3	4	2	4	4
Blue Cards	2	1	3	1	1

Make separate predictions for the number of red cards in the whole deck based on Samples 3, 4, and 5.

5. What are the highest and lowest predictions?
6. Describe the variation of all your predictions.
7. Which of your predictions do you think is most accurate?
8. Make an inference on the number of red cards that are in the whole deck based on all six samples combined.
9. Kris also recorded the shapes on the cards.

Sample	1	2	3	4	5
Squares	2	3	4	4	3
Circles	3	2	1	1	2

Make an inference about the number of circles in the deck.

Use after Lesson 11-5.

ACTIVITY



1. Make a deck of 20 cards. Each card should have a blue circle, a blue square, a red circle, or a red square. Trade decks with a partner, shuffle, and choose five cards. How many circles did you choose?
2. Return the cards to the deck, shuffle, pick five new cards, and record the results four more times. Record the results in a table.

Sample	1	2	3	4	5
Squares					
Circles					

Test Prep Tip

The mean, median, or mode of the predictions can be used to make an inference that is in the center of the predictions.

3. For each sample, estimate the number of cards in the full deck that are circles.
4. Describe the variations in your estimates.
5. Make an inference about the number of squares and the number of circles that are in the deck after looking at all five samples.
6. How do your final results compare to your first estimate?
7. Repeat the experiment and record the color of each card. Predict the number of red and blue cards in the deck.
8. Sort the cards. How do your inferences compare to the population?

ACTIVITY



The principal asked the four student council officers to survey samples of the student body about after-school activities.

Favorite After-School Activity

	Sports	Band	Clubs	Tutoring	No Activity
Bo	15	10	13	8	4
Mel	15	8	12	7	8
Lea	14	7	12	8	9
Zoe	19	8	13	2	8

1. How many observations are in each student's sample?
2. Five hundred students are enrolled in the whole school. Make four separate predictions for the number of students who favor tutoring based on the results of each survey.
3. Gauge the variation in the predictions.
4. Make an inference about the number of students who favor tutoring based on the median of your predictions.



Writing in Math

5. Is it advantageous to make inferences based on multiple samples instead of just one sample? Explain.

CC-14

Simulating Compound Events



CONTENT STANDARDS

7.SP.8.c Design and use a simulation to generate frequencies for compound events.



for Help
Lesson 12-2

Vocabulary Tip

A *compound event* consists of two or more events.

A **simulation** is a model used to calculate probabilities for an experimental situation. A compound event consists of two or more simple events. These events may have different probabilities of occurring.

ACTIVITY



One half of the students enter projects in the science fair and two fifths of the students compete in the annual spelling bee.

- Jemal wants to find the experimental probability that a student enters the science fair and also participates in the spelling bee. The available tools are shown below.



Coins

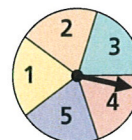


Number Cubes



Spinner

- Which tools can Jemal use to simulate a student entering the science fair? Explain how he can use them.
 - Which tools can Jemal use to simulate a student participating in the spelling bee? Explain how he can use them.
- Jemal decides to use a coin and a five-section spinner.
 - Jemal lets tails (T) represent a student entering the science fair, and sections 1 and 2 on the spinner represent a student participating in the spelling bee. What does the result below mean?



- Jemal records the result as H4 and repeats the simulation 23 more times. He records the results in a table.

H4	T4	T3	H2	T3	H5	H2	T4
T2	H2	H1	H4	H1	T1	T4	T5
H3	H1	H4	T1	T1	H2	T2	H5

Which compound events represent a student participating in the science fair and competing in the spelling bee?

- What is the experimental probability that a student enters the science fair and participates in the spelling bee?

Use after Lesson 12-4.

ACTIVITY**GO for Help****Activity 12-2b**

At an art school, 30% of the students are left-handed. Denise wants to know the probability that in a group of 4 students, at least 1 is left-handed.

1. Denise generates random digits from 0 to 9 and lets the digits 0, 1, and 2 represent a left-handed student. Is this a good tool to simulate the event that a student is left-handed?
2. The table below shows randomly generated 4-digit numbers.

7982	5839	4965	8814	3900
3933	6042	9397	4856	8373
3890	2305	3601	8174	4919
6022	6107	7903	9409	8271

Use the first 4-digit number in the table to simulate the results of asking one group of 4 students. How many are left-handed?

3. Identify all of the 4-digit numbers in the table that represent the event *at least 1 of the 4 students is left-handed*.
4. What is the experimental probability that in a group of 4 students, at least 1 is left-handed?
5. If you did not have this table of random numbers, would a coin or a number cube be a good tool to simulate this event? Explain.
6. How can you simulate asking 30 groups of 5 students if they are left-handed?

Exercises

1. a. At Perlina's school, 30% of the students prefer folk music, 10% prefer country, 20% prefer rock, and 40% prefer hip-hop. Describe how to use a random number table with digits 0-9 to simulate finding the probability that in a group of 3 students, at least 2 prefer hip-hop.
b. Use the random number table below to find the probability that in a group of 3 students, at least 2 like hip-hop.

165	108	952	944	542
661	827	647	333	457
950	593	087	169	813
614	869	738	027	284

2. **Writing in Math** One third of students walk to school, and 80% buy hot lunch. You want to know the probability that a student walks to school but does not buy hot lunch. Describe how you could simulate 25 trials to determine how many students walk to school but do not buy hot lunch.